Results

Rate of success:

Twenty patients received 21 epikeratophakia grafts in a prospective clinical trial of epikeratophakia in comparison with keratomileusis. One graft was lost as a result of persistant epithelial defect and necrosis, another graft was removed as a result of trauma and a second graft was performed on this patient, which was successful. The overall success rate was 95.2 % (Werblin et al, 1981b).

The epikeratophakia lenticule was maintained in 37 (92.5%) of 40 patients who underwent epikeratophakia for aphakia with commercially prepared tissue. complications required the removal of 3 tissue lenses (Arffa et al, 1986b).

The rate of success among the epikeratophakia group in a retrospective study of 30 procedures was 87 % (26 patients). The complication rate was 13% (4 patients) one case each of interface infiltrate, graft edge melt,

delayed epithelialization, and irregular astigmatism . All of these patients underwent removal and replacement of the lenticule with a satisfactory visual result (Durrie et al, 1987).

Of 519 procedures performed for the correction of aphakia in adults in the nationwide study, 22 (4) resulted in removal of the tissue lens: 13 because of failure to reepithelialize or chronic epithelial defects, 6 because of refractive error, and one each as a result of a torn lens, lens thining with irregular astigmatism and infiltrate between lens and host. One third of these patients underwent a second, successful epikeratophakia procedure (Mc Donald et al, 1987).

Keratometric and Refractive Changes:

In a prospective clinical trial of epikeratophakia in comparison with keratomileusis, only 14 patients were randomized between the 2 procedures, the patients who underwent epikeratophakia had statistically significantly faster and better visual recovery in terms of spectacle overcorrection than did patients who underwent keratomileusis.

Comparison of preoperative and postoperative keratometry reading showed a small, statistically insignificant increase in corneal astigmatism (table 14).

Table 14

Astigmatism after Epikeratophakia

Average Cylinder, Diopters		
Preoperative	Postoperative	Undercorrection, D
2.65 ± 1.96 (19)	3.07 ± 2.24 (19)	4.66 ± 2.67 (18)

Number in parentheses are numbers of patients averaged.

Patients who underwent epikeratophakia showed 0.42D of cylinder . The major problem with the final refractive results was undercorrection, which averaged 451D. The oldest surviving epikeratophakia graft has remained stable for about 7 months (Werblin et al, 1981b).

Sixty-five epikeratophakia procedures have been performed by Mc Donald et al. (1983) in 63 patients.

Patients with more than one year of follow-up showed stable keratometry readings. Early patients achieved 70% of the predicted diopteric correction, more recent patients have achieved 87% with improvements in the lathing procedure, tissue handlings, and surgical technique.

In the nationwide study (1985), 111 adult aphakic patients receiving tissue from a commercial source . Three to four months postoperative visual and refractive data became available on 42 of these cases .

Mean preoperative spherical equivalent was 11.4D with a range from 5.5 D to 15.5 D (Table 15). By 3-4 months postoperatively, the mean overcorrection was 0.97 D with a range of - 3 D to + 4.1 D.

35% of cases were corrected to within 10% of emmetropia and 92% of cases were corrected to within 30% of emmetropia (Table 16). 34% of cases were corrected to within 1D of emmetropia and 59% were corrected to within 2 D (Table 17) (Mc Donald and Kaufmain. 1986a).

Table 15

Refractive Results
Nationwide study of Adult aphakia

	Preoperative	3 months Postoperative
Mean spherical equivalent (D)	11.4	0.97
Standard deviation	2.2	2.4
Minimum	5.5	-3.0
Maximum	15.5	4.1

Table 16
Deviation from Emmetropia as Percentage of Preoperative Spherical Equivalent
Nationwide adult Aphakia Study

Percent Deviation from Emmetropia	Percent of Patients	Cumulative Percent
≤ 10%	35%	35%
11 - 20%	27%	62%
21 - 30%	31%	92%
> 30%	8%	100%

Table 17

Absolute deviation from Emmetropia

Nationwide Adult Aphakia Study

Deviation from Emmetropia	Percent of Patients	Cumulative Percent
≤ 1D	34%	34%
1.1 to 2.0 D	25%	59%
2.1 to 3.0 D	25%	84%
3.1 to 4.0 D	12%	97%
4.1 to 5.0 D	3%	100%

The records of 39 adult patients who underwent epikeratophakia for aphakia with commercially prepared tissue were reviewed. Forty procedures were performed in the 39 patients. refractive follow-up of at least 3 months was available for 28 patients (85%). Twenty-five of the 28 patients had keratometry measurements, 19 patients (58%) had refractive and keratometric follow-up 6 months after surgery; and 6 patients were followed up for 12 months.

Preoperative patient data are as follows. The average age was 45.9 ± 23.0 years. The average preoperative refractive error (spherical equivalent in the spectacle plane) was + 11.36 ± 1.38 D., and the average preoperative keratometry measurement was 43.48 ± 1.75 D. The average lenticule power was +13.75 ± 1.98D.

The average refractive error 3 months after surgery was + 0.67 ± 1.97D. Eight (29%) of 28 patients were within 1D of emmetropia and 25 (90%) patients were within 3D of emmetropia. The remaining 3 patients were within 5D of emmetropia

Sixteen patients had undergone epikeratophakia using the spreading technique, and 12 patients had undergone epikeratophakia using the non-spreading technique. There was no significant difference in refractive results between these two groups of patients (Table18). Six months after surgery, the average refractive error was -0.18 ± 2.27 d. Seven (37%) of 19 patients were within 1 D of emmetropia dn 16 (85%) of 19 were within 3 D.

Table 18

Spreading vs Nonspreading Technique

	Spreading	Nonspreading
3 months after surgery No	16	12
Spherical equivalent refractive error, diopters	+0.83 ± 2.13	+0.47 ± 1.80
No of patients ≤ 1D from emmetropia	4/16	4/12
No of patients ≤ 3D from emmetropia	13/16	12/12
6 months after surgery No.	11	8
Spherical equivalent refractive error, D	+0.48 ± 2.34	+1.07 ± 1.98
No of patients ≤ 1D from emmetropia	2/11	5/8
No of patients ≤ 3D from emmetropia	10/11	6/8
Change in refractive astigmatism	+0.61 ± 1.07	+1.93±1.64

The remaining 3 patients had refractive errors between -3 and -6 D. As at 3 months, there was no significant difference in refractive results between patients who underwent the spreading technique and those who underwent the nonspreading technique.

Seventeen patients were examined at both 3 and 6 month after surgery. The average change in refractive error between 3 and 6 months was - 0.77 D, with 10 patients becoming more myopic, 5 patients becoming more hyperopic, and 2 patients staying the same. In 6 of the 17 patients the change was 1 D or less, in 14 patients the change was 2 D or less, and in 3 patients myopia increased by 2.38 to 3.75 D.

Two of six patients at 12 months after surgery were within 1D of emmetropia, 5 of 6 patients were within 3D, and the remaining patients had an error of + 3.38 D. The average refractive error in these 6 patients 12 months after surgery was + 0.77± 2.11 D.

The average keratometry measurements 3 months after surgery was 53.99 ± 1.94 D, an increase of 10.11 D in these patients . This is slightly less than the change in refractive error at the corneal plane, which was 12.48 D. The average keratometry value obtained in patients examined 6 months after surgery was 55.16 ± 1.94 D, 11.67D greater than their preoperative measurements. The change in refractive error in the corneal plane was 12.87 D in these patients.

The increase in manifest spectacle cylinder was + 1.00 D at 3 months, + 1.18 D at 6 months and + 0.75 at 12 months. A 6 months after surgery the average change in manifest cylinder was significantly greater in the patients who underwent the non spreading technique, compared with those who underwent the spreading technique (Table 18). The change in keratometric cylinder was + 0.72 D at 3 months, + 1.33 D at 6 months and - 0.11 D at 12 months .

Postoperative residual hyperopia at 3-4 months after surgery has decreased from an average of 4.7 D in the first report (1981), to 0.7 D in the present cases. The spread in refractive results around these means has also decreased, from 2.7 D to 2.0 D. (Arffa et al, 1986b).

In a study done by Durrie et al, (1987) of 30 procedure there is more scattering of the actual power obtained with a tendency toward undercorrection in the lower power lenticules, and overcorrection in the high power lenticules (Fig 3)/ The mean spherical equivalent was + 0.58 D (range, - 3.87 to +3.25 D)

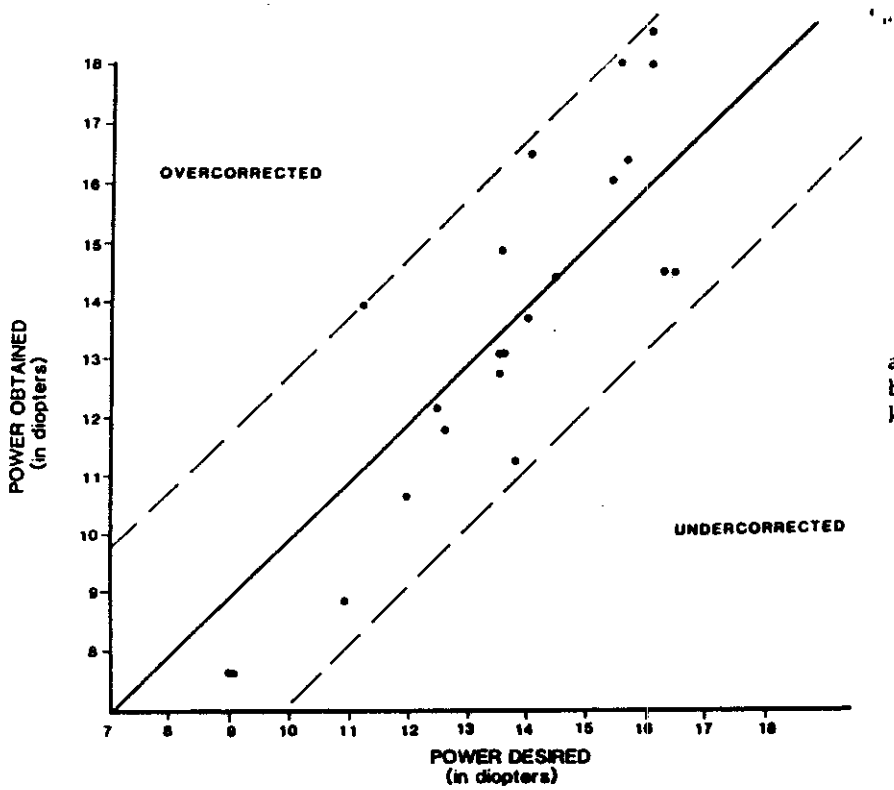

Fig. 3 (Durrie, Habrich, and Dietze). Power predictability for patients with epikeratophakia lenticules.

In the nationwide study of epikeratophakia 519 procedures for the correction of aphakia in adults. Of 229 patients, 172 (75%) were corrected to within 3 D of emmetropia, nearly three fourths of the remaining 25% outside the 3 D demarcation were undercorrected. Average keratometric readings demonstrated corneal steepening. Preoperatively, mean keratometry readings were 43.57 ± 1.84 D , increasing postoperatively to 53.66 ± 3.75 D corneal astigmatism measured by keratometry increased from a preoperative mean of 2.1 ± 1.8 D to a postoperative mean of 2.7 ± 2.6 D. Mean spherical equivalent at the spectacle plane was + 11.5 ± 1.92 D before surgery and + 0.9 ± 2.83 D after surgery (McDonald et al, 1987).

Visual Acuity:

In the study done by Werblin et al (1981), on 32 patients, they were followed-up for at least 8 months. Patients with normal visual potential before surgery had average visual acuities with spectacle overcorrection of 20/50 at 4 months, 20/40 at 8 months, and 20/30 at one year.

The results of a prospective clinical study of hyperopic epikeratophakia grafts for the visual rehabilitation of aphakic patients are presented. Visual acuity data are given for 21 aphakic who have been followed for up to 6 months postoperatively. With spectacle overcorrection, on the average, patients were within 3 lines of their preoperative potential vision at 3 months postoperative and within 2 lines at 6 months postoperative Three months postoperatively, 2 patients achieved Visual Acuity of 20/20, and 57% had 20/40 or better with spectacle overcorrection.

Six months postoperatively, 3 patients achieved best corrected visual acuities of 20/20, and 80% had best corrected visual acuities of 20/40 or better (Werblin et al, 1981b).

The records of visual acuities of the series done by Arffa et al, (1986) Showed the following. Preoperative spectacle visual acuity is compared with spectacle visual acuity at 3,6, and 12 months after surgery in Table 19. Of patients with 20/40 or better preoperative spectacle visual acuity, 14 (38 % 24 achieved 20/40 spectacle visual acuity by 3 months. The remaining 10 patients

(42%) had a visual acuity between 20/50 and 20/100 . At 6 months, 10 (59%) of 17 had a visual acuity 20/40 or better and the remaining 7 patients (41%) had a visual acuity between 20/50 and 20/70. At 12 months 5(83%) of 6 patients had a visual acuity of 20/40 or better and one patient (17%) had a visual acuity of 20/50. There was no significant difference in results between the spreading and non spreading techniques. Between 3 and 6 months after surgery, spectacle-corrected visual acuity improved in 8 patients, remained the same in 8 patients, and decreased by one line in one patient (Arffa et al, 1986b).

Table 19

Visual Results at 3, 6 and 12 months after surgery*

Range of Visual Acuity	Time after surgery					
	3 mo		6 mo		12 mo	
	Without Correction, No.(%) of Patients	With Correction, No.(%) of Patients	Without Correction, No.(%) of Patients	With Correction, No.(%) of Patients	Without Correction, No.(%) of Patients	With Correction, No.(%) of Patients
20/20-20/40	4/23 (17)	14/24 (58)	3/17 (18)	10/17 (59)	1/6 (17)	5/6 (83)
20/50-20/100	11/23 (48)	10/24 (42)	11/17 (64)	7/17 (41)	4/6 (66)	1/6 (17)
20/200-20/400	8/23 (35)	0/24 (0)	3/17 (18)	0/17 (0)	1/6 (17)	0/6 (0)
<20/400	0/23 (0)	0/24 (0)	0/17 (0)	0/17 (0)	0/6 (0)	0/6 (0)

*Patients with 20/40 or better spectacle-corrected visual acuity preoperatively.

In the nationwide study (1985), at 3-4 months postoperatively, 29% of patients had 20/50 or better vision without correction, 58% had 20/100 vision or better, and only 14% had poorer than 20/400 uncorrected vision (Table 20) (Mc Donald and kaufman, 1986a).

Table 20

3 mos Postoperative Visual Results

Nationwide Adult Aphakia Study

Visual Acuity	Percentage of Patients Without Correction	With Correction
20/20 - 20/50	29%	62%
20/60 - 20/100	29%	28%
20/200 - 20/400	29%	10%
< 20/400	14%	0%

In the nationwide study of epikeratophakia (1987), 519 procedures have been performed for the correction of aphakia in adults.

Of 310 patients, 245 (95%) demonstrated improved uncorrected visual acuity after surgery, with 138 (53%) improving by 4 or more Snellen lines, and another. 70 (27%) improving by 3 lines Nearly half (119 of 266) demonstrated uncorrected visual acuity better than 20/100 postoperatively (Table 21). Of 265 patients, 209 (79%) achieved within 2 lines or better of their best corrected visual acuity postoperatively, 130 (49%) showed no change or improved, one by as much as eight lines.

Table 11

Visual Acuity

Visual Acuity	Without Correction				With Correction			
	PREOPERATIVE (N = 272)		POSTOPERATIVE (N = 266)		PREOPERATIVE (N = 278)		POSTOPERATIVE (N = 266)	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)
20/15 to 20/40	0	(0)	35	(13)	203	(73)	169	(64)
20/50 to 20/100	0	(0)	119	(45)	61	(22)	80	(30)
20/200 to 20/400	17	(6)	97	(36)	11	(4)	17	(6)
Worse than 20/400	255	(94)	15	(6)	3	(1)	0	(0)

Percentages may not add up to 100% because of rounding.

Visual outcome was significantly affected by the length of time after suture removal (Table 22). Of the 119 patients who equaled or improved their preoperative best corrected visual acuity after surgery, 110 (92%) were within 2 lines by 30 to 60 days after suture removal (Table 22).

Table 22

VISUAL ACUITY AS A FUNCTION OF TIME AFTER SUTURE REMOVAL *

Time After Suture Removal (Days)	No.	Patients Achieving Given Level of Best Corrected Visual Acuity (N = 130)							
		Equal To Preoperative		- 1 Line		- 2 Lines		- > 2 Lines	
		No.	(%)	No.	(%)	No.	(%)	No.	(%)
30 to 60	119	42	(35)	44	(37)	24	(20)	9	(8)
61 to 120	127	77	(61)	40	(32)	8	(6)	2	(2)
121 to 180	129	96	(74)	32	(25)	1	(1)	0	(0)
> 180	130	130	(100)	0	(0)	0	(0)	0	(0)

*All patients who equaled or improved their preoperative best corrected visual activity are included.

Patient age was also a significant factor in visual outcome (Table23). Although 123 of the 150 patients (82%) achieved within one snellen line or better of their preoperative best corrected visual acuity , there were considerable differences among the age group. This level of recovery was obtained by 67 patients (97%) between 18 and 70 years of age and 48 patients (83%) between 81 and 87 years of age. Of the 69 patients between 18 and 70 years old, 2(3%) lost 3 or more lines of best corrected visual acuity, of those between 71 and 80 years of age, 10 of 58 (17%) lost 3 or more lines of best corrected visual acuity, and of those between 81 and 87 years of age, 15 of 23 (65%) lost 3 or more lines of best corrected visual acuity. Four of the patients who lost 3 or more lines of best corrected visual acuity demonstrated posterior capsule haze. Of 52 patients who lost one or more lines of best corrected visual acuity in the eyes with the epikeratophakia lens (Table 23), 43 (83%) also lost one or more lines in the contralateral eye, suggesting a possible decrease in retinal function with time (Mc Donald et al,1987).

Table 23

Change in best corrected Snellen Line Chart Visual Acuity

as a function of patient age*

Change In Visual Acuity (SNELLEN LINES)	Patients aged 18 to 70 Years (N = 69)		Patients aged 71 to 80 Years (N = 58)		Patients aged 81 to 87 Years (N = 23)		Total No. Of Patients (N = 150)		Cumulative %
	No.	(%)+	No.	(%)+	No.	(%)+	No.	(%)+	
+ 2 or more	13	(19)	10	(17)	2	(9)	25	(17)	17%
+ 1	13	(19)	7	(12)	2	(9)	22	(14)	31%
No Change	31	(45)	18	(31)	2	(9)	51	(34)	66%
- 1	10	(14)	13	(22)	2	(9)	25	(17)	83%
- 2	2	(3)	7	(12)	5	(21)	14	(9)	92%
- 3 or more	0	(0)	3	(5)	10	(44)	13	(9)	100%

*Only those patients with three or more months of follow-up after suture removal are included in this table.

+Percentages may not add up to 100% because of rounding.

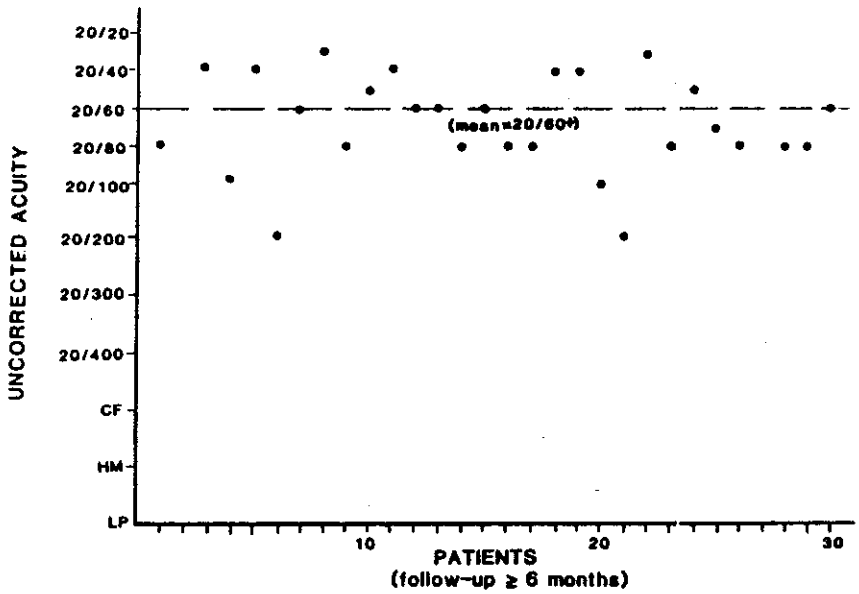

Fig. 4 (Durrie, Habrich, and Dietze). Postoperative uncorrected visual acuity in the epikeratophakia group. Follow-up greater than six months.

Reepithelialization

Reepithelialization is usually complete between 4-7 days after surgery in adult patient (Mc Donald and kaufman, 1986). The mean time required for the reeplthelialization of the surface of the epikeratophakia tissue lens was 7.1 days, with a range from 1-14 days (Mc Donal et al, 1987).

Corneal thickness

Mean central corneal thickness showed an increase of 0.35 mm as a result of the addition of the epikeratophakia tissue (Mc Donald et al, 1987).

Clarity of tissue lens

The tissue lenses are clear by 3-4 weeks after surgery (Arffa el al, 1987).

Measurement of Intraocular Pressure after Epikeratophakia

Epikeratophakia results in corneas that are nearly doubled in thickness. To test the reliability of standard instrumentation for the measurement of intraocular pressure in such eyes, the Goldman applanation prism in the hand-held Perkins portable tonometer and the Mackay-Marg tonometer were used to measure IOP in vivo in eyes with epikeratophakia grafts.

Measurements were compared with actual intraocular readings from a transducer. The Mackay-Marg tonometer was reliable at pressures above 20 mm Hg, the extrathickness of the graft impaired the accuracy below 20 mm Hg The Goldman tonometer was accurate over the entire range pressures. (Olson, 1983).

Specular Microscopy of Corneal Epithelium After Epikeratophakia

Rao et al. (1987), studied the characteristics of the corneal epithelium by specular microscopy in 12 eyes of 11 patients, at 3,6 and 16 months after

epikeratophakia surgery. At each visit both eyes were anesthetized with topical 0.5% proparacaine, and 20 photographs of each eye were taken. At least 3 photographs of each eye were selected for detailed analysis under high magnification.

The mophologic analysis included the shape and size of cells, cell density, dark/light cell ratio, and the identification of other changes.

On examination, all grafts were clear. No important epithelial abnormalities were detected clinically. Analysis of epithelial photographs showed marked alteration in the epithelial surface cells after epikeratophakia in all eyes. However the appearance of the epithelium varied with the length of the postoperative period.

Three months after surgery, there was a complete absence of normal epithelial characteristics despite the slit-lamp appearance of the corneal surface. The cells appeared markedly irregular, attenuated and decreased in density. There was no differentiation into cells of different sizes or dark and light cells, and no normal interdigitation between adjacent cells. After 6 months,

with the addition of onlay graft. The average preoperative endothelial cell count was low (1,450 per mm^2 ± 218) and did not differ significantly from the average postoperative cell count (1,4 38 per mm^2 ± 218). Despite the increase in corneal thickness and low endothelial cell counts, there was no corneal edema. So, epikeratophakia is well tolerated by the cornea and can be performed safely on eyes that have already undergone substantial trauma to the endothelium. (Guss,1983)

In another study done by Durrie et al (1987) on 30 adult aphakic patients, preoperatively, the mean endothelial cell count was 1,300 cells/mm^2 (range, 1,000 to 3,500/mm^2). Four to six months postoperatively the mean was 1,600 cells/ mm^2 (range, 700 to 2,400 cells/mm^2).

In the nationwide study of epikeratophakia, endothelial cell counts were not significantly different before and after surgery (Mc Donald et al, 1987).

Corneal sensitivity after epikeratophakia:

Corneal sensitivity was tested in 40 eyes of 20 patients who underwent unilateral epikeratophakia for the correction of aphakia. Postoperative recovery time ranged from 2 months to 21 months (mean: 10 months) The results indicate a relative hypesthesia of the epikeratophakia lenticule when compared with the peripheral host cornea and contralateral central cornea. However, corneal sensitivity tested in patients with more than one year follow-up was increased compared with the sensitivity of patients whose postoperative recovery was less than 1 year.

Histopathologic findings in 2 lenticules demonstrated sparse epithelial axon terminals. Most corneal nerves appear to innervate the lenticules by intraepithelial extension and by penetration of the superficial keratectomy scar (Koenis el al, 1983)

Corneal sensitivity was measured in 10 eyes using an esthesiometer. The measurements were taken at the center and at the 3,6,9, and 12 o'clock positions of the periphery of the epikeratophakia graft as well as the peripheral host cornea. Corneal sensitivity measured

clearly demonstrated that the epikeratophakia grafts were hypesthetic even after 16 months (Table 24). The mean value at the center of the button was 7.5 mm, while at the periphery, it was 9.0 mm. The peripheral host cornea had a mean corneal sensitivity of 49 mm (Rao et al, 1987)

Table 24

Corneal Sensitivity Measurements

Case No.	GRAFT		
	Center (MM)	Periphery (MM)	Host (MM)
1	10	10	50
2	5	5	40
3	10	10	40
4	5	10	40
5	5	10	50
6	5	10	50
7	10	10	55
8	10	10	55
9	5	5	40
10	10	10	55
Mean	7.50	9.00	49.0

Histopathology of a case of epikeratophakia:

An epikeratoplasty button was removed by penetrating keratoplasty 31 months following an aphakic epikeratoplasty because of the patient's poor best corrected visual acuity (20/80 with the following correction: + 8.5- 1.5 x35.) light microscopy showed 5-7 epithelial cell layers were seen over the central cornea. The layers decreased to 2 near the periphery of the lenticule, then increased to 8-10 cell layers at the wound margin. The epithelium at the periphery of the lenticule was squamous in appearance and exhibited abnormal maturation. The thickened epithelium at the wound margin appeared normal. The donor lenticule thickness ranged from 43% of the total corneal thickness in the periphery to 56% in the center. Minor bends and focal fractures in the donor Bowman's membrane were noted. An acellular zone was seen in the central posterior half, and a hypocellular zone was present in the central anterior half of the donor lenticule. keratocytes zone were seen immediately adjacent to both sides of the interface. A normal keratocyte population was seen at the periphery of the lenticule. The recipient

tissue had normal-appearing keratocytes. The keratocyte population in the anterior donor lenticule was 17.42 (± 2.1) cells/ mm^2 compared with 33.11 (±2.72) cells/ mm^2 in the recipient stroma.

The unusual keratocyte repopulation and increased collagen interfibrillar distance in the present specimen cannot be explained on the basis of tissue preparation, but could be due to the duration of freeze, the chemicals used in the cryoprotectant solutions, the quality of the donor material (Age, time from death to cryolathing), the thickness and diameter of the epikeratoplasty lenticule, and, probably most importantly, the depth and width of the circumferential keratotomy incision that permits keratocyte repopulation.

Keratocyte repopulation is biochemical phenomenon associated with normal epithelium, which may produce trophic factors that stimulate keratocyte repopulation (Binder et al, 1985).

Advantages of epikeratophakia

Surgically, epikeratophakia is no more complex than the earlier refractive keratoplastic techniques from which it was derived. In addition, because no lamellar dissection of the central visual axis of the patient's cornea is required, this procedure is reversable. Therefore, should the epikeratophakia graft need to be removed the patient is still eligible for alternate forms of correction, including a second graft of this type (Werblin et al 1981a).

Also the procedure is less complicated technically , no sophisticated instruments such as the microkeratome or cryolathe were used during surgery. The lenticules are preshaped to the recipient's specifications, so that the surgeon need not master the intricacies of lathing corneal tissue as a part of the operative procedure (Oslon et al, 1983).

Although the correction achieved with an epikeratophakia graft was not so precise as that which can be obtained with a contact lens, there is recent evidence that the infant eye possesses an extremely large depth of focus and the optical blur may not be as detrimental to visual acuity in the very young as it is in adults. In the young patients with amblyopia precise corrections are not essential for occlusion therapy to be effective. As these patients grow the eyes may become myopic. Spectacle lenses may be used to correct the myopia, and it has been suggested that such a reverse-Galilian- telescope system is advantageous because it minimize image- size disparity. Alternatively, it may prove feasible to replace one epikeratophakia graft with another of different power as the patient ages, or to remove the graft and convert to contact lens correction.

The permanent placement of the correction on the eye eliminates some of the problems associated with contact lenses, such as loss or manipulation by the child and the expense of replacement. Furthermore, this procedure reduces long-term maintenance and replacement costs of contact lenses (Morgan et al, 1983b).

To summarize, the advantages of epikeratophakia are:

1) Epikeratophakia is safe because the microkeratome is not needed, and the central cornea is not invaded,

2) The procedure is reversable, i.e. the lens can easily be removed, with the use of topical anesthetic drops, during an office visit;

3) The surgery is not technically complex, and requires no complex or unusual equipment or instrumentation; and

4) Learning to perform epikeratophakia does not involve training, or a significant learning curve (Mc Donald and Koufaman, 1986a).